

**PLANT NUTRIENT RECOMMENDATIONS BASED ON SOIL TESTS FOR VEGETABLE CROP PRODUCTION**

*Source: University of Maryland Cooperative Extension, November 2009  
Regulatory Citation: COMAR 15.20.08.05*

**Important Notes**

1. For most vegetables grown on light-textured soils, apply the total recommended P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O together with 25 to 50 percent of the recommended nitrogen before planting. The remaining nitrogen can be side dressed with a fertilizer containing nitrogen only. Side dressing or topdressing potash (K<sub>2</sub>O) is recommended only on extremely light sandy soils with very low cation exchange capacities.
2. It may be desirable to build up the phosphorus and potassium levels in very low-fertility loam and silt loam soils more rapidly than provided by these recommendations. In such instances, add an additional 40 to 50 pounds of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O, respectively, to the recommendations listed in the table for soils testing low in phosphorus and potassium. Apply the additional amounts in broadcast and plow down or broadcast and disk-in application.
3. In absence of soil tests, use recommendations listed under medium phosphorus and medium potassium levels on light-textured soils that have been in intensive vegetable production.

Crop	Nitrogen (N) pounds per acre	Recommended Nutrients Based on Soil Tests						Total amount of nutrient recommended and suggested methods of application
		Soil phosphorus level			Soil potassium level			
		Low	Medium	Optimum	Low	Medium	Optimum	
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre			
<b>ASPARAGUS</b>		Apply 1-2 pounds of boron (B) per acre every 3 years on most soils. See Table 1 for more specific boron recommendations.						
<b>Growing crowns</b>	50	200	100	50	200	100	50	Total recommended Broadcast & disk in
	50	200	100	50	200	100	50	
<b>New plantings (Crown &amp; transplant)</b>	75-100	200	100	50	200	100	50	Total recommended Broadcast & plow down
	50	200	100	50	200	100	50	Sidedress 4 wks after planting
	25-50	0	0	0	0	0	0	
<b>Cutting beds</b>	75-100	200	150	100	300	225	150	Total recommended Broadcast & disk in
	75-100	200	150	100	300	225	150	
<b>BEANS</b>		Apply 1-2 pounds of boron (B) per acre every 3 years on most soils. See Table 1 for more specific boron recommendations.						
<b>Lima, single crop</b>	60-80	100	60	20	140	100	60	Total recommended Broadcast & disk in -OR-
	30-40	100	60	20	140	100	60	Band-place with planter
	30	50	30	10	30	15	0	Sidedress 3-5 wks after emergence
	30-40	0	0	0	0	0	0	
<b>Lima, after peas</b>	20	0	0	0	0	0	0	Band-place with planter
<b>Snap, single crop</b>	40-80	80	60	40	80	60	40	Total recommended Broadcast & disk in Band place with planter
	20-40	40	40	0	40	40	0	
	20-40	40	20	40	40	20	40	
<b>Snap, after peas</b>	0-20	0	0	0	0	0	0	Sidedress at pre-bloom stage
<b>BEETS</b>		Apply 1½-3 pounds of boron (B) per acre in mixed fertilizer. See Table 1 for more specific boron recommendations.						
	75-100	150	100	50	150	100	50	Total recommended Broadcast & disk in Sidedress 4-6 weeks after planting
	50	150	100	50	150	100	50	
	25-50	0	0	0	0	0	0	

Crop	Nitrogen (N) pounds per acre	Recommended Nutrients Based on Soil Tests						Total amount of nutrient recommended and suggested methods of application
		Soil phosphorus level			Soil potassium level			
		Low	Medium	Optimum	Low	Medium	Optimum	
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre			
<b>BROCCOLI</b>	Apply 1½-3 pounds of boron (B) per acre in mixed fertilizer. See Table 1 for more specific boron recommendations.							
	150-200	200	100	50	200	100	50	Total recommended Broadcast & disk in Sidedress 2-3 weeks after planting Sidedress 4-6 weeks after planting
	50-100	150	100	50	150	100	50	
	50	50	0	0	50	0	0	
50	0	0	0	0	0	0		
<b>BRUSSELS SPROUTS, CABBAGE &amp; CAULIFLOWER</b>	Apply 1½-3 pounds of boron (B) per acre and 0.2 pound molybdenum (Mo) as 0.5 pound sodium molybdate per acre with broadcast fertilizer.							
	100-150	200	100	50	200	100	50	Total recommended Broadcast & disk in Sidedress 2-3 weeks after planting Sidedress if needed according to weather
	50-75	200	100	50	200	100	50	
	25-50	0	0	0	0	0	0	
25-50	0	0	0	0	0	0		
<b>CARROTS</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
	50-80	150	100	50	15	100	50	Total recommended Broadcast & disk in Sidedress if needed
	50	150	100	50	150	100	50	
25-30	0	0	0	0	0	0		
<b>CELERY</b>	Apply 1½-3 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
	150-175	250	150	100	250	150	100	Total recommended Broadcast & disk in Sidedress 2-3 weeks after planting Sidedress 6-8 weeks after planting
	50-75	250	150	100	250	150	100	
	25-50	0	0	0	0	0	0	
25-50	0	0	0	0	0	0		
<b>CUCUMBER</b>	100-125	150	100	50	200	150	100	Total recommended Broadcast & disk in Band-place with planter Sidedress when vines start to run, or apply in irrigation water
	25-50	125	75	25	175	125	75	
	25	25	25	25	25	25	25	
	25-50	0	0	0	0	0	0	
<b>EGGPLANT</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
	125-150	250	150	100	250	150	100	Total recommended Broadcast & disk in Sidedress 3-4 weeks after planting Sidedress 6-8 weeks after planting
	50-100	250	150	100	250	150	100	
	25-50	0	0	0	0	0	0	
25-50	0	0	0	0	0	0		
NOTE: If crop will be mulched with plastic but NOT drip/trickle fertilized, broadcast 225 pounds of nitrogen (N) per acre with recommended P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> and disk-in or incorporate prior to laying mulch. See "Eggplant" in nutrient recommendation section for drip/trickle fertilization at the end of this chapter.								
<b>ENDIVE, ESCAROLE &amp; LEAF LETTUCE</b>	100-125	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress 3-5 weeks after planting
	50-75	200	150	100	200	150	100	
	25-50	0	0	0	0	0	0	

Crop	Nitrogen (N) pounds per acre	Recommended Nutrients Based on Soil Tests						Total amount of nutrient recommended and suggested methods of application
		Soil phosphorus level			Soil potassium level			
		Low	Medium	Optimum	Low	Medium	Optimum	
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre			
<b>GARLIC</b>		Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.						
<b>Fall-planted</b>	125	200	100	50	200	100	50	Total recommended Broadcast & disk in Topdress when 6 inches tall Topdress May 1
	75	200	100	50	200	100	50	
	25	0	0	0	0	0	0	
	25	0	0	0	0	0	0	
<b>HORSERADISH</b>		Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.						
<b>Loamy sands &amp; sandy loams</b>	150-200	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress 3-5 weeks after planting Sidedress later in season if needed
	50	200	150	100	200	150	100	
	50-100	0	0	0	0	0	0	
	50	0	0	0	0	0	0	
<b>Loams &amp; silt loams</b>	100-150	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress 4-6 weeks after planting if needed
	100	200	150	100	200	150	100	
	50	0	0	0	0	0	0	
<b>LETTUCE, ICEBERG (HEAD)</b>	60-80	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress 3-5 weeks after planting
	25-50	200	150	100	200	150	100	
	25-30	0	0	0	0	0	0	
<b>LEAFY GREENS: COLLARDS, KALE, MUSTARD &amp; TURNIP GREENS</b>	50-80	150	100	50	150	100	50	Total recommended Broadcast & disk in Sidedress if needed
	50	150	100	50	150	100	50	
	25-30	0	0	0	0	0	0	
<b>LEEK</b>		Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.						
	100-125	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress 3-4 weeks after planting if needed
	50-75	200	150	100	200	150	100	
	25-50	0	0	0	0	0	0	
<b>MUSKMELON</b>		Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.						
	75-100	150	100	50	200	150	100	Total recommended Broadcast & disk in Band-place with planter Sidedress when vines start to run, or apply in irrigation water
	25-50	125	75	25	175	125	75	
	25	25	25	25	25	25	25	
	25-50	0	0	0	0	0	0	
	NOTE: If crop will be mulched with plastic but NOT drip/trickle fertilized, broadcast 100-150 pounds of nitrogen (N) per acre with recommended P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> and disk-in or incorporate prior to laying mulch. See "Muskmelon" in nutrient recommendation section for drip/trickle fertilization at the end of this chapter.							
<b>OKRA</b>	Same as Eggplant							

Crop	Nitrogen (N) pounds per acre	Recommended Nutrients Based on Soil Tests						Total amount of nutrient recommended and suggested methods of application
		Soil phosphorus level			Soil potassium level			
		Low	Medium	Optimum	Low	Medium	Optimum	
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre			
<b>ONION</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
<b>Bulb</b>								
	75-100	200	100	50	200	100	50	Total recommended Broadcast & disk in Sidedress 4-5 weeks after planting
	50-75	200	100	50	200	100	50	
	25-50	0	0	0	0	0	0	
<b>Green (scallion)</b>								
	150-200	200	100	50	200	100	50	Total recommended Broadcast & disk in Sidedress 4-5 weeks after planting Sidedress 3-4 weeks before harvest
	50-75	200	100	50	200	100	50	
	50	0	0	0	0	0	0	
	50	0	0	0	0	0	0	
<b>PARSLEY</b>								
	150-175	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress after first cutting Sidedress after each additional cutting
	50-75	200	150	100	200	150	100	
	25-50	0	0	0	0	0	0	
	25-50	0	0	0	0	0	0	
<b>PARSNIP</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
	50-75	150	100	50	150	100	50	Total recommended Broadcast & disk in Sidedress 4-5 weeks after planting
	25-50	150	100	50	150	100	50	
	25-30	0	0	0	0	0	0	
<b>PEAS</b>	40-80	120	80	40	120	80	40	Broadcast & disk in before seeding
<b>PEPPER</b>	Apply 1 pound of boron (B) per acre if soil test boron is low. See Table 1 for more specific boron recommendations.							
	100-150	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress after first fruit set Sidedress later in season if needed
	50	200	150	100	200	150	100	
	50	0	0	0	0	0	0	
	0-50	0	0	0	0	0	0	
	NOTE: If crop will be mulched with plastic but NOT drip/trickle fertilized, broadcast 150 pounds of nitrogen (N) per acre with recommended P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> and disk-in or incorporate prior to laying mulch. See "Pepper" in nutrient recommendation section for drip/trickle fertilization at the end of this chapter.							
<b>POTATO, SWEET</b>								
	50-75	200	100	50	300	200	100	Total recommended Broadcast & disk in Sidedress when vines start to run
	25	200	100	50	300	200	100	
	25-50	0	0	0	0	0	0	
<b>POTATO, WHITE</b>	Apply 1 pound of boron (B) per acre if soil test boron is low. See Table 1 for more specific boron recommendations.							
Sandy loams & loamy sands								
	150	200	150	100	300	200	100	Total recommended Broadcast & disk in Sidedress 4-6 weeks after planting
	50	200	150	100	300	200	100	
	100	0	0	0	0	0	0	

Crop	Nitrogen (N) pounds per acre	Recommended Nutrients Based on Soil Tests						Total amount of nutrient recommended and suggested methods of application
		Soil phosphorus level			Soil potassium level			
		Low	Medium	Optimum	Low	Medium	Optimum	
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre			
<b>POTATO, WHITE, cont'd</b>	125-150	200	150	100	300	200	100	Total recommended Broadcast & disk in Band-place with planter
Loams & silt loams	50	100	100	0	200	100	0	
	75-100	100	50	100	100	100	100	
NOTE: If soil test levels for P <sub>2</sub> O <sub>5</sub> or K <sub>2</sub> O are above optimum (high), an additional 30 pounds of each nutrient may be used to replace crop removal.								
<b>PUMPKIN &amp; WINTER SQUASH</b>	50-100	150	100	50	200	150	100	Total recommended Broadcast & disk in Sidedress when vines start to run
	25-50	150	100	50	200	150	100	
	25-50	0	0	0	0	0	0	
<b>RADISH, RUTABAGA &amp; TURNIP</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							Broadcast & disk in before seeding
	50	150	100	50	150	100	50	
<b>SPINACH</b>								
<b>Spring or fall planting</b>	100-195	200	150	100	200	150	100	Total recommended Broadcast & disk in Sidedress or topdress after first cutting
	50-75	200	150	100	200	150	100	
	25-40	0	0	0	0	0	0	
	25-40	0	0	0	0	0	0	Sidedress or topdress after each cutting
<b>Overwintered crop</b>	80-120	0	0	0	0	0	0	Total recommended Topdress late February Topdress in March
	50-80	0	0	0	0	0	0	
	30-40	0	0	0	0	0	0	
<b>SUMMER SQUASH</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							Total recommended Broadcast & disk in Sidedress when vines start to run Apply through irrigation system
	75-100	150	100	50	200	150	100	
	25-50	150	100	50	200	150	100	
	50	0	0	0	0	0	0	
	25-30	0	0	0	0	0	0	
<b>STRAWBERRY</b>								
<b>Annual production system</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							Total recommended Disk in before bedding Inject through drip at first spring flowering Inject through drip at fruit enlargement
Loamy sands & sandy loams	90-120	165	115	65	165	115	65	
	60-75	165	115	65	165	115	65	
	15-25	0	0	0	0	0	0	
	15-25	0	0	0	0	0	0	
Loams & silt loams	70-90	150	100	50	150	100	50	Total recommended

Crop	Recommended Nutrients Based on Soil Tests							Total amount of nutrient recommended and suggested methods of application
	Nitrogen (N) pounds per acre	Soil phosphorus level			Soil potassium level			
		Low	Medium	Optimum	Low	Medium	Optimum	
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre			
	50-60	150	100	50	150	100	50	Disk in before bedding
	20-30	0	0	0	0	0	0	Inject through drip at first spring flowering
	See "Strawberry" section at the end of this chapter for fertilizer recommendations for plants grown on plastic mulch.							
<b>STRAWBERRY, cont'd.</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
<b>Matted row system, new planting</b>	110-150	165	115	65	165	115	65	Total recommended
Sandy loams, loamy sands & sands	30	165	115	65	165	115	65	Broadcast & disk in deep
	20-30	0	0	0	0	0	0	Sidedress 2 weeks after planting
	20-30	0	0	0	0	0	0	Sidedress when first runners start
	30-40	0	0	0	0	0	0	Topdress in mid-August
	10-20	0	0	0	0	0	0	Topdress in February or March
<b>Matted row system, new planting</b>	90-120	150	100	50	150	100	50	Total recommended
Loams & silt loams	30	150	100	50	150	100	50	Broadcast & plow or disk in deep
	30-40	0	0	0	0	0	0	Sidedress when first runners start
	30-50	0	0	0	0	0	0	Topdress in mid-August
<b>Matted row system, established</b>	50-60	165	115	65	165	115	65	Topdress at renovation
Sandy loams, loams & silt loams	30	0	0	0	0	0	0	Topdress in February or early March
	NOTE: Plantings in clay or clay loam soils should receive total nitrogen rates to 25 percent,; and also reduce the spring application rate to 0-50 percent.							
Loamy sands & sands	60-80	165	115	65	165	115	65	Topdress at renovation
	30	0	0	0	0	0	0	Topdress in February or early March
<b>SWEET CORN</b>	Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
<b>Fresh Market</b>	125-150	160	120	80	160	120	80	Total recommended
	40-60	120	100	60	120	100	60	Broadcast & plow down
	20	40	20	20	40	20	20	Band-place with planter
	50-75	0	0	0	0	0	0	Sidedress when corn is 12-18 inches tall
	NOTE: For early plantings when soil temperatures are low, band 20 pounds of P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> when soil test levels are above optimum (high). On very light sandy soils, sidedress 40 pounds of nitrogen per acre when corn is 6 inches tall and another 40 pounds of nitrogen per acre when corn is 12-18 inches tall.							

Crop	Nitrogen (N) pounds per acre	Recommended Nutrients Based on Soil Tests						Total amount of nutrient recommended and suggested methods of application	
		Soil phosphorus level			Soil potassium level				
		Low	Medium	Optimum	Low	Medium	Optimum		
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre				
<b>SWEET CORN, cont'd.</b>		Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
<b>Processing</b>	125-175	120	80	60	120	80	60	Total recommended Broadcast before plowing Band-place 2 inches below and 2 inches to the side of the seed (2x2) Sidedress 2 weeks after emergence	
	55-80	80	60	40	80	60	40		
	20	40	20	20	40	20	20		
	50-75	0	0	0	0	0	0		
		NOTE: For early plantings when soil temperatures are low, band 20 pounds of P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> when soil test levels are above optimum (high).							
<b>TOMATO</b>									
<b>Fresh market</b>		Apply 1½-3 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
Sandy loams & loamy sands	80-90	200	150	100	300	200	100	Total recommended Broadcast & plow down Sidedress when first fruits set	
	40-45	200	150	100	300	200	100		
	40-45	0	0	0	0	0	0		
Loams & silt loams	50-80	200	150	100	200	150	100	Total recommended Broadcast & plow down Sidedress when first fruits set, if needed	
	50	200	150	100	200	150	100		
	25-30	0	0	0	0	0	0		
		NOTE: See "Tomato" in nutrient recommendation section for drip/trickle fertilization at the end of this chapter.							
<b>Processing, transplants for machine harvest</b>		Apply 1-2 pounds of boron (B) per acre with broadcast fertilizer. See Table 1 for more specific boron recommendations.							
Sandy loams & loamy sands	50-75	200	150	100	250	150	100	Total recommended Broadcast & plow down Broadcast & disk in Sidedress at first cultivation	
	0	100	50	0	150	50	0		
	25	100	100	100	100	100	100		
	25-50	0	0	0	0	0	0		
Loams & silt loams	50	200	150	100	250	150	100	Total recommended Broadcast & plow down Broadcast & disk in	
	0	100	100	50	150	100	50		
	50	100	50	50	100	50	50		
		NOTE: Excess nitrogen hinders concentration of fruit maturity for machine harvest. NOTE: See "Tomato" in nutrient recommendation section for drip/trickle fertilization at the end of this chapter.							
<b>WATERMELON</b>									
<b>Non-irrigated</b>		80-100	150	100	50	200	150	100	Total recommended Broadcast & disk in Topdress when vines start to run
	50	150	100	50	200	150	100		
	25-50	0	0	0	0	0	0		

Crop	Nitrogen (N) pounds per acre	Recommended Nutrients Based on Soil Tests						Total amount of nutrient recommended and suggested methods of application
		Soil phosphorus level			Soil potassium level			
		Low	Medium	Optimum	Low	Medium	Optimum	
		P <sub>2</sub> O <sub>5</sub> pounds per acre			K <sub>2</sub> O pounds per acre			
<b>Irrigated</b>	125-150	150	100	50	200	150	100	Total recommended Broadcast & disk in Topdress when vines start to run Topdress after first harvest
	50	150	100	50	200	150	100	
	25-50	0	0	0	0	0	0	
	25-50	0	0	0	0	0	0	

NOTE: Higher N rates may lead to increase in hollow heart in seedless watermelon varieties; apply 125 pounds of nitrogen (N) per acre of seedless watermelon. See "Watermelon" in nutrient recommendation section for drip/trickle fertilization at the end of this chapter.

## Boron Fertilization on Vegetable Crops

The most practical way to apply boron to the soil is as an additive bought specifically for the crop or field where it is needed and mixed in the fertilizer. Do not use fertilizer containing more than 0.5 pound of boron (B) per ton of fertilizer for crops not listed below, unless specifically recommended. To avoid possible boron toxicity damage to crops, apply boron in broadcast fertilizer rather than banded or sidedressed. Boron may be broadcast preplant as a soluble spray alone or with other compatible soluble chemicals.

**Table 1. Boron Recommendations Based on Soil Tests for Vegetable Crops**

Interpretation of boron soil tests			Crops that often need additional boron <sup>1</sup>	Recommended pounds boron (B) per acre <sup>2</sup>
Parts per million	Pounds per acre	Relative level		
0.0-0.35	0.0-0.70	Low	Beets, broccoli, Brussels sprouts, cabbage, cauliflower, celery, rutabaga, turnip	3
			Asparagus, carrot, eggplant, horseradish, leek, muskmelon, okra, onion, parsnip, radish, squash, strawberry, sweet corn and tomato	2
			Pepper and sweet potato	1
0.36-0.70	0.71-1.40	Medium	Beets, broccoli, Brussels sprouts, cabbage, cauliflower, celery, rutabaga, turnips	1½
			Asparagus, carrot, eggplant, horseradish, leek, muskmelon, okra, onion, parsnip, radish, squash, strawberry, sweet corn and tomato	1
>0.70	>1.40	High	All crops	0

<sup>1</sup> If boron deficiency is suspected in vegetable crops not listed above, use soil and/or plant tissue test results as a basis for treatment recommendations.

<sup>2</sup> Approximate conversion factors to convert elemental boron (B) to different boron sources:

Boron (B) x 9 = borax (11.36% B)

Boron (B) x 7 = fertilizer borate granular (14.3% B)

Boron (B) x 6.7 = fertilizer borate-48 (14.91% B)

Boron (B) x 5 = fertilizer borate-65 (20.2% B) or Solubor® (20.5% B)

Boron (B) x 4.7 = fertilizer borate-68 (21.1% B)

Example: Using borax, apply  $9 \times 1.5 = 13.5$  pounds borax per acre to meet a 1.5 pound boron (B) per acre recommendation.

## Nutrient Recommendations for Drip/Trickle Fertilization

### Introduction to Fertigation

Trickle-irrigated crops are usually fertilized during the growing phase through the irrigation system, or fertigated. When using trickle/drip irrigation in combination with plastic mulch, apply the recommended rate of preplant nutrients and incorporate 5-6 into the soil before laying the mulch. If equipment is available apply the preplant fertilizer at the recommended rates only to the soil area that will be covered by the mulch. This is more cost-effective than broadcasting fertilizer over the entire field.

All rates of soluble fertilizers delivered through fertigation are determined on a 3-foot-wide surface area, even though the crops are grown on 5-foot rows. A "fertilized-mulched acre" is an acre (43,560 sq. ft.) of soil surface covered by the mulch. For example, when 4-foot-wide plastic mulch is laid on 5-foot row centers with 6 inches of each edge buried, 2 feet of the 5-foot row is uncovered while 3 feet is covered by the mulch. This means that only 3/5 or 60% of the field acreage is fertigated. All recommendations for fertigation through a trickle/drip system are based on the fertilized-mulched acre.

### Eggplant

Before mulching, adjust soil pH to around 6.5 and then apply enough farm-grade fertilizer to supply 60 pounds per acre of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. Then thoroughly incorporate into the soil. If soil tests medium or less in soil potassium, apply a fertilizer with a ratio of 1-1-2 or 1-1-3 carrying 60 pounds of nitrogen per acre.

After mulching and installing the trickle irrigation system, apply completely soluble fertilizers to supply 40 pounds (10 to 20 pounds in Pennsylvania) of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per fertilized-mulched acre during each application (a description of a fertilized-mulched acre may be found in the "Irrigation" section of this publication). On soils testing low and low to medium in boron and that have not received any preplant boron fertilizer, include 0.25 pound of actual boron per fertilized-mulched acre in each soluble fertilizer application.

The first soluble fertilizer application should be applied through the trickle irrigation system within 1 week after field transplanting the eggplants. The same rate of soluble fertilizer should be applied about every 3 weeks during the growing season for a total of six to seven applications. In Pennsylvania, do not exceed 120 pounds of nitrogen per acre per season.

## Muskmelon

Before mulching, adjust soil pH to around 6.5, apply enough farm-grade fertilizer to supply 50 pounds per acre of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O, and thoroughly incorporate into the soil.

After mulching and installing the trickle irrigation system, apply completely soluble fertilizer to supply 50 pounds (5 to 15 pounds in Pennsylvania) of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per fertilized-mulched acre during each application. (A description of a fertilized-mulched acre may be found in the "Irrigation" section of this publication.) On soils testing low and low to medium in boron and that have not received any preplant boron fertilizer, include 0.5 pound of actual boron per fertilized-mulched acre in each soluble fertilizer application.

The first soluble fertilizer application should be applied through the trickle irrigation system within 1 week after field transplanting the melons. The same rate of soluble fertilizer should be applied again when the first fruit set. The third application should be applied about 2 weeks before the first harvest.

Heavier late yields have been achieved by applying another application at the same rate of soluble fertilizer in between the first and second soluble fertilizer applications or about 2 weeks after the first soluble fertilizer application. In Pennsylvania, do not exceed 80 pounds of nitrogen per acre per season.

## Pepper

Before mulching, adjust soil pH to around 6.5 and then apply enough farm-grade fertilizer to supply 50 pounds (40 pounds in Pennsylvania) per acre of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O and then thoroughly incorporate into the soil. If the soil tests medium or less in soil potassium, apply a fertilizer with a ratio of 1-1-2 or 1-1-3 carrying 50 pounds of nitrogen per acre.

After mulching and installing the trickle irrigation system, apply completely soluble fertilizers to supply 30 pounds (15 pounds in Pennsylvania) of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O per fertilized-mulched acre during each application. (A description of a fertilized-mulched acre may be found in the "Irrigation" section of this publication.) In Pennsylvania, do not exceed 80 to 90 pounds of N per acre per season. On soils testing low and low to medium in boron, also include 0.25 pound of actual boron per fertilized-mulched acre in each soluble fertilizer application.

The first soluble fertilizer application should be applied through the trickle irrigation system within 1 week after field transplanting peppers. The same rate of soluble fertilizer should be applied about every 3 weeks during the growing season for a total of 6 applications through the trickle irrigation system. The

soluble fertilizer may be delivered in 12 equally timed applications through the growing season, provided the soluble nutrients are applied at half the above suggested rates per application so that the total seasonal rates of N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and B are the same. The number of fertilizer applications can be reduced for late plantings and in areas where the growing season is short.

These rates were developed on sandy loam soils with a cation exchange capacity (CEC) of 3 to 5. If your soil has a lower CEC, you may wish to increase the total seasonal soluble fertilizer nutrient rates by at least one-third. On very coarse, very low CEC soils, you may wish to increase the total seasonal soluble fertilizer nutrient rates by two-thirds.

On the heavier textured soils with CEC above 3 to 5, you may wish to decrease the total seasonal soluble fertilizer nutrients by one-half to three-quarters. In very heavy soils with high CEC, you may wish to broadcast the total seasonal plant nutrient requirements (according to soil test) before mulching and installing the trickle irrigation system. In this case, only water would be applied through the trickle irrigation.

## Strawberry (annual production system) Growing on plastic mulch

Pre-plant: Test the soil to determine specific nutritional needs. Broadcast and work into beds a complete fertilizer containing 60 to 75 pounds of actual nitrogen per fertilized-mulched acre. Include P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O and boron at the rates recommended previously in this section. Prepare raised beds (30 to 40 inches wide and 6 to 8 inches high) on 5- to 5½-foot row centers. Beds should be center-crowned and firm.

Follow the spring fertilizer injection timing and rates under the strawberry listing for annual production system. Depending upon soil type, plant vigor and plant tissue test results, it may be justified to inject an additional 30-40 pounds nitrogen per fertilized-mulched acre. For late summer renovation, apply 60 pounds of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O per fertilized-mulched acre in early September.

## Tomato

Before mulching, adjust soil pH to around 6.5 and then apply enough farm-grade fertilizer to supply 40 pounds per acre of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O, then thoroughly incorporate into the soil. If the soil tests medium or less in soil potassium, apply a fertilizer with a ratio of 1-1-2 or 1-1-3 containing 40 pounds of nitrogen per acre.

After mulching and installing the trickle irrigation system, apply completely soluble fertilizer to supply 40 pounds (in Pennsylvania use 5 to 15 pounds) of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O per fertilized-mulched acre during each

application. (A description of a fertilized-mulched acre may be found in the "Irrigation" section of this publication.) On soils testing low and low to medium in boron, also include 0.5 pound of actual boron per fertilized-mulched acre in each of the three or four fertilizer applications.

The first soluble fertilizer application should be applied through the trickle irrigation system within 1 week after field transplanting the tomatoes. The same rate of soluble fertilizer should be applied again when the first fruit reach 1 inch in diameter and again when the fruit begin to turn color and ripen. A fourth application of the same rate of soluble fertilizer 2 weeks after the third application has helped to increase yield, but may not be economical. In Pennsylvania, do not exceed 90 pounds of nitrogen per acre per season.

### **Watermelon**

Before mulching, adjust soil pH to around 6.5, apply enough farm-grade fertilizer to supply 50 pounds

per acre of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O, then thoroughly incorporate into the soil.

After mulching and installing the trickle irrigation system, apply completely soluble fertilizers to supply 25 pounds (5 to 15 pounds in Pennsylvania) of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O per fertilized-mulched acre during each application. On soils testing low and low to medium in boron, also apply 0.25 pound of actual boron per fertilized-mulched acre in each soluble fertilizer application.

The first soluble fertilizer application should be applied through the trickle irrigation system within 1 week after field transplanting the watermelons. The same rate of soluble fertilizer should be applied 2 weeks later. The third application should be made when the first fruit set. Make a fourth application 2 weeks before the first harvest. The fifth application should be applied right after the first harvest. To maintain good production late into the season, apply another application three weeks after the fifth complete fertilizer application. In Pennsylvania, do not exceed 80 pounds of nitrogen per acre per season.